THE USE OF COUNTRYSIDE STEWARDSHIP SCHEME FIELD MARGINS BY THE SMALL SKIPPER *THYMELICUS SYLVESTRIS* (PODA), ESSEX SKIPPER *THYMELICUS LINEOLA* (OCHS.) AND LARGE SKIPPER *OCHLODES VENATA* (BREM. & GREY) (LEP.: HESPERIIDAE)

[1]R. G. Field, [2]G. Watkins and [2]T. Gardiner

[1] *166 Sherwood Avenue, Northampton, NN2 8TE*
(E-mail: rfield8633@aol.com)

[2] *CERA, Writtle College, Writtle, Chemlsford, CM1 3RR*

Abstract

Abundance of Small Skipper *Thymelicus sylvestris*, Essex Skipper *Thymelicus lineola* and Large Skipper *Ochlodes venata* adults was monitored at three farms in Essex between 1997 and 2000 and again in 2003 on grass field margins of varying widths. There were significantly more Small Skipper and Essex Skipper on two-metre wide margins than on non-margin field edges, but there was a significant reduction over time in abundance of both these species and Large Skipper *Ochlodes venata* on the two-metre margins. When the six-metre margins and the control sections were compared there was no significant difference in abundance on them for the three species. A lack of nectar sources, the use of agricultural cultivars of common grasses, inappropriate management and the small size of some of the margins are suggested as reasons for the lack of abundance.

Introduction

The three butterflies discussed in this paper are the Small Skipper *Thymelicus sylvestris* (Poda), the Essex Skipper *Thymelicus lineola* (Ochs.) and the Large Skipper *Ochlodes venata* (Br. & Grey).They are all butterflies associated with tall uncut grassland, roadside verges, woodland rides and clearing (Asher *et al.* 2001). *T. lineola* favours drier parts while *O. venata* is often found in damp areas. The main larval foodplant for *T. sylvestris* is Yorkshire Fog *Holcus lanatus* and for *T. lineola* and *O.venata* is Cocksfoot *Dactylis glomerata*. The adults of *O. venata* start to fly in late May or early June, followed about two weeks later by *T. sylvestris* and *T. lineola* a week later than that. The three are on the wing for periods in July and early August with a few surviving through until late August or early September (Asher *et al.*, 2001, Watkins & Field, 2003; 2004). The eggs of the *T. sylvestris* and *T. lineola* are laid in small batches in the leaf sheaths of the foodplants, while *O. venata* lay theirs singly on the underside of the leaves of the foodplant. The eggs of *T. sylvestris* and *O. venata* hatch after about two to four weeks but the eggs of the *T. lineola* do not hatch until springtime. The larvae of the *T. sylvestris* and *O. venata* form tubes of leaf blades to overwinter in and along with the eggs of T. lineola are highly susceptible to the grass being cut or grazed in autumn or winter (Brakefield *et al.*, 1992).

The three butterflies form closed populations (Warren, 1992), often only travelling 20-280 m (Asher *et al.*, 2001) and require a minimum breeding area of 0.5-1 ha (Thomas, 1984). Feber *et al.* (1996) suggested that the best predictor for *T. sylvestris* abundance in July was the abundance of Oxeye Daisy *Leucanthemum vulgare.*

Goldsmith (1991) suggests that the ideal height of vegetation for *T. sylvestris*, *O. venata* and *T. lineola* is about 50 cm.

The establishment of field margins was promoted when the Countryside Stewardship Scheme (CSS), as administered by MAFF from 1996, was launched countrywide in that year (Rebane & Tucker, 1997). The grass margins were to be established around arable fields to provide habitats, such as feeding areas for small mammals and birds of prey and wildlife corridors. The two-metre grass margins can be also used to buffer field boundaries, streams, and rivers from agricultural operations (Smallshire & Cooke, 1999).

The six metre margins could either be established using natural regeneration or sown with the seed of at least four grasses, a list of which is provided with the agreement. The seed rate was 20 kg/ha with no one grass being more than 40% of the mix. The natural regeneration option was allowed if the advisor considered that there was a suitable seed bank in the soil. The margins had to be cut, and the cuttings removed, four times in the first year and then each year after the 15 July in subsequent years.

The two metre grass margins had to be sown with a tussocky grass mix containing at least 50% Timothy *Pheum pratense* and/or *D. glomerata*, and/or *H. lanatus*. The margin should be cut three times in the first year, with the cuttings removed, and then only one year in three and then only to stop encroachment of scrub species (MAFF, 1999).

The aim of this study was to establish whether the two metre and six metre grass margins as set up and managed using CSS rules would produce suitable habitats for *T. sylvestris*, *O. venata* and *T. lineola.*

Methods

The research project took place at three farms in Essex which joined the CSS in 1996. These were at: Writtle (NGR: TL670070), Highwood (NGR: TL630036) and Greenstead Green (NGR: TL810288. These sites were monitored during the flight period of the butterflies between 1997 and 2000 and again in 2003. The main attributes of the two metre grass margins are as in Field *et al.* (2004) and the six metre margins and control sections (field edges without grass margins) are highlighted in Table 1. The seed mixtures used and the final DAFOR scores (Bullock, 1996) can be found in Table 2. These six metre margins were established in 1996 (seven) and 1997 (one), five by sowing with a grass only seed mix, two by natural regeneration from bare soil and one (W3) from natural regeneration from an agricultural grass ley (Tables 1 & 2).

Butterfly abundance was recorded once a week for each of the margins and control sections using the transect method (Pollard, 1977) when the conditions were suitable (Pollard & Yates, 1993) during the flight period. The transect data was obtained from the Writtle College Butterfly Monitoring Scheme (BMS) transects which were walked by the authors during the summer period (Sellers & Field, 1998; Gardiner & Field, 1999; 2000; 2001; Watkins & Field, 2002; 2003; 2004). Under the

Table 1. Attributes of the margins.

Site	Size margin (m)	Section length	Aspect	Hedgerow Length (m)	Sown	Riverside
Writtle						
W1	6	631	E/W	310	Nat	Yes
W2	6	701	E/W	350	Nat	Yes
W3	6	720	NNE/SSW	200	Nat	Yes
W4	6	190	E/W	0	Yes	No
W5	None	450	E/W	400		Yes
Greenstead Green						
G1	6	417	NW/SE	417	Yes	Yes
G2	6	322	NW/SE	322	Yes	Yes
G3	6	166	NW/SE	166	Yes	Yes
G4	6	345	NW/SE	345	Yes	Yes
G5	none	250	NW/SE	250		Yes

Nat – Natural regeneration

Table 2. Seed mixtures used on the six metre margins.

	Writtle	DAFOR 2003	Greenstead Green	DAFOR 2003
Date set up	Oct 1997		Oct 1996	
Length in research (m)	190		1250	
Seed mix	1		2	
Cynosurus cristatus	25%	F	7.5%	F
*Festuca ovina**	15%	Nr	25%	Nr
Festuca rubra ssp. *commutata*	5%	Nr	30%	A
Agrostis capillaries	15%	R	5%	O
Festuca arundinacea	12.5%	A		
Dactylis glomerata	12.5%	A		
Festuca pratenis	5%	Nr		
*Trisetum flavescens**	5%	Nr		
Alopecurus pratensis	5%	R		
*Poa pratensis**			7.5%	Nr
Festuca rubra			25%	Nr

Nr – not recorded

* not suitable for soil type (Marshall, 1998)

BMS rules *T. sylvestris* and *T. lineola* are recorded as *Thymelicus* spp. due to the difficulty of identification in flight between these two species. This will therefore take place in this study. The number of butterflies seen per km per visit was then calculated for the transect and the research sections.

Results

Significantly more *Thymelicus* spp. were observed on the two metre margins than on the control sections (Table 3), but there was no significant difference on the six metre margins (Table 3) or on either types of margins for *O. venata* (Table 4). One six metre grass margin, G4, was sown next to a field already in permanent set-aside which had been sown with a diverse grass mixture but managed under set-aside rules. On this margin the abundance of *Thymelicus* spp. was far greater than on the other two or six metre margins (Figure 1). There was a significant reduction in abundance of *T. sylvestris*, *O. venata* and *T. lineola* between 1997 and 2003 on the two metre grass margins (Table 5).

None of the key nectar sources identified by Feber *et al.* (1996) were available on any of the six metre margins and only on one of the two metre grass margins. The main sources of nectar identified were Thistles *Cirsuim* spp. which were available occasionally in all of the margins. The height of vegetation in the margins was on average about 50 cm except for W3 which was dominated by Rye grasses *Lolium* spp. and was only about 30 cm in height on average. The vegetation was generally dense with few open areas except for W3 which had the more open character of a *Lolium* dominated sward.

Discussion

The habitat requirement of the *T. sylvestris*, *O. venata* and *T. lineola* seemed in general to be well served by the CSS two metre grass margins, but unfortunately this was not shown to be the case with the findings from this research. At the three sites there was a significant reduction in abundance on the two metre grass margins over the research period. *T. sylvestris* and *T. lineola* were significantly more abundant on the two grass margins than on the control sections, but the overall reduction is more important.

The larval food plants *H. lanatus* and *D. glomerata* were available in practically every two metre grass margin at one site, Greenstead Green. The management should have suited both butterflies. They both prefer taller vegetation (Asher *et al.*, 2001), though they are sedentary and 66% only move 20m (max. 280m) (Asher *et al.*, 2001). The lack of nectar sources could have a significant impact here as the female's eggs are immature at emergence and they need nectar for the eggs to develop. Smith *et al.* (1993) found that six out of seven *T. sylvestris* and *T. lineola* were found on margins sown with a wildflower and grass mix which had been left uncut. Feber *et al.* (1996) found that the abundance of *L. vulgare* was the best predictor of *T. sylvestris* abundance, but only one of the two metre grass margins had this in, and then only in very small numbers. None of the two metre grass margins met the minimum habitat size requirement of 0.5 to 1 hectare (Thomas, 1984).

The authors must draw the conclusion that the lack of nectar sources was a major factor in the decline in abundance. Another possible reason was that agriculturally improved grass seed used for *H. lanatus* and *D. glomerata* in the two metre grass margins had produced larval food plants which were possibly not suitable for the larvae to feed on. However there is no direct evidence for this, but the decline in abundance could suggest these as possible causes (Field, 2004).

At Writtle and Highwood, not only were the favoured nectar plants not available but there was no *H. lanatus* in the margins at Writtle and it was only found rarely in two of the margins at Highwood. This would have had a serious affect on abundance of the *T. sylvestris* and both *T. sylvestris* and *T. lineola* would have been affected by the lack of nectar sources.

Table 3. Skipper abundance (per km per visit) observed during the two metre grass margin experiment 1997-2000 and 2003.

Butterflies	Two metre margins Mean (Range)	Control Mean (Range)	Significance
Thymelicus spp.	13.8 (63.84-0)	12.8 (172.9-0)	** **
Ochlodes venata	3.88 (36.47-0)	0.63 (2.78-0)	ns

Mann-Whitney *U*-test: ** = P<0.01 ns = no significance

Table 4. Skipper abundance (per km per visit) observed during the six metre grass margin experiment 1997-2000 and 2003.

Butterflies	Six metre margins Mean (Range)	Control Mean (Range)	Significance
Thymelicus spp.	4.5 (21.4-0)	2.4 (6.7-0)	ns
Ochlodes venata	0.31 (1.21-0)	0.72 (2.54-0)	ns

Mann-Whitney *U*-test: ns = no significance

Table 5. Skipper abundance (per km per visit) observed during the two metre grass margin experiment 1997 and 2003.

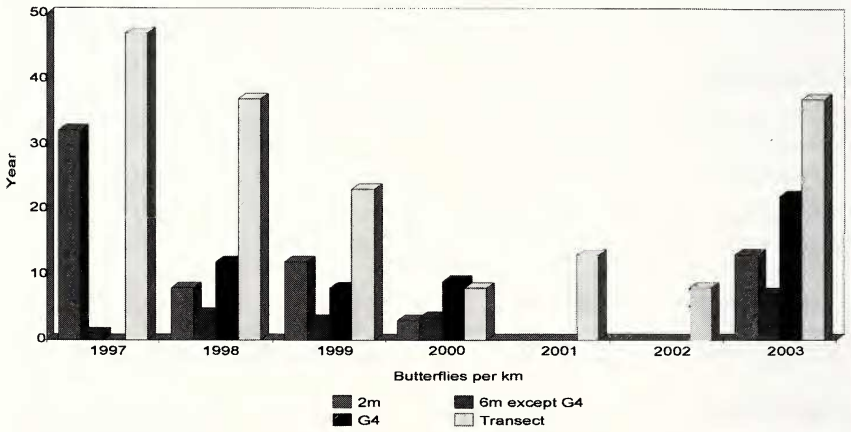
Butterflies	1997 Mean (Range)	2003 Mean (Range)	Significance
Thymelicus spp.	32.39 (63.84-0.58)	13.22 (32.1-1.7)	*
Ochlodes venata	15.34 (36.47-0)	1.26 (4.25-0)	*

Mann-Whitney *U*-test: * = P<0.05

So to sum up, the two metre grass margins should have been suitable for *T. sylvestris*, *O. venata* and *T. lineola*, but this research has shown that under current CSS guidelines this is not always the case. The correct larval plants were not always included in the seed mix, there was a lack of nectar plants, and the area of the margins were not big enough, though the management probably suited them.

The six metre grass margins were better overall for *Thymelicus* spp. abundance than the control sections, but all the comments regarding two metre grass margins, except management, also relate to six metre grass margins. The management of the six metre grass margins does not suit the *T. lineola* as the eggs remain on the tall grass stems for eight months (Frohawk, 1934) and are highly vulnerable to cutting (Brakefield *et al.*, 1992). The eggs of the *T. sylvestris* are also highly vulnerable to cutting as it can be at least a month before the larvae emerges, so any early cut can remove all the eggs of both species.

Figure 1. *Thymelicus* spp. abundance 1997-2003.



The best six metre grass margin was G4 (linked to set-aside) with more than twice the number of *Thymelicus* spp. in 2003 than on the other three margins at Greenstead Green. If comparing non-linear (whole fields) to linear (field margins) ratios (Clausen *et al.*, 2001), G4 (non-linear) would have a value of 3.88 to 1 (nl/1), compared with 2 to 1 (nl/1) in the Clausen *et al.* study. So the conclusions for the six grass margins are similar to those for the two metre grass margins: not enough larval or nectar plants, and the area being too small. Inappropriate management of the six metre grass margins ensured the abundance *Thymelicus* spp. and *O. venata* was less than on the two metre grass margins.

In conclusion, suitable seed for nectar plants should be included in the seed mixtures for both two and six metre grass margins and the management of six metre grass margins should be less rigid, allowing part to be left uncut. Further

investigation should be conducted into whether agricultural cultivars of the common grasses used in the majority of CSS grass margins are in fact suitable larval hosts for the species which use their native namesakes.

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